

WHAT IS CLAIMED IS:

- Sub-A* 1. An image processing method comprising:
- incorporating input frame pictures to be displayed on a display device, on the basis of an input picture signal and an input synchronizing signal which is synchronized with the input picture signal;
 - recording the incorporated input frame pictures in an input frame memory; and
 - producing output frame pictures from the input frame pictures, which have been recorded in the input frame memory, by producing an interpolated picture or inserting a black raster picture or thinning out the input frame pictures, between input frame pictures corresponding to a picture information of the input frame picture to be displayed, on the basis of the picture information and the input synchronizing signal and an output synchronizing signal.
2. An image processing method as set forth in claim 1, wherein the production of the output frame pictures comprising:
- comparing the refresh rate of the input frame pictures with the refresh rate of the output frame pictures;
 - outputting the input frame pictures as the output frame picture, or outputting the input frame pictures, between which the black raster picture is inserted, as the output frame pictures, when the refresh rate of the input frame pictures is equal to the refresh rate of the output frame pictures;
 - producing an interpolated picture between the input frame pictures, or outputting the input frame pictures, between which the black raster picture is inserted, as the output frame pictures, when the refresh rate of the output frame pictures is higher than the refresh rate of the input frame pictures; and
 - thinning out the input frame pictures, or

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producing an interpolated picture between the input frame pictures, or outputting the input frame pictures, between which the black raster picture is inserted, as the output frame pictures, when the refresh rate of the output frame pictures is lower than the refresh rate of the input frame pictures.

3. An image processing method as set forth in claim 1, wherein the picture information includes information which indicates whether the picture to be displayed is a moving picture or a still picture, and the method further comprises discriminating whether the picture to be displayed is a moving picture or a still picture.

4. An image processing method as set forth in claim 3, wherein the discriminating comprises:

incorporating frame pictures to be displayed, at regular intervals on the basis of the input picture signal and the input synchronizing signal; and

obtaining the correlation between two frame pictures which have been continuously incorporated,

the method discriminating whether the picture to be displayed is a moving picture or a still picture on the basis of the correlation result.

5. An image processing method as set forth in claim 4, wherein when it is determined that the picture to be displayed is a moving picture, the discriminating comprises determining whether the moving picture is in a first state in which the motion of a moving object in the moving picture is rapid, or in a second state in which the moving speed of the moving object is slower than that in the first state, on the basis of the correlation.

6. An image processing method as set forth in claim 5, wherein the correlation is obtained on the basis of

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the difference between pixels corresponding to the continuously incorporated two frame pictures.

7. An image processing method as set forth in claim 5, wherein the correlation is obtained on the basis of the scalar quantity of a motion vector.

8. An image processing method as set forth in claim 5, wherein when it is discriminated that the picture to be displayed is a moving picture and when it is determined that the moving speed of the moving object in the moving picture is in the first state, the production of the output frame pictures comprises:

comparing the refresh rate of the input frame pictures with the refresh rate of the output frame pictures;

outputting the input frame pictures as the output frame picture, when the refresh rate of the input frame pictures is equal to the refresh rate of the output frame pictures;

producing an interpolated picture between the input frame pictures to output the interpolated picture, when the refresh rate of the output frame pictures is higher than the refresh rate of the input frame pictures; and

thinning out the input frame pictures to produce and output the output frame pictures, when the refresh rate of the output frame pictures is lower than the refresh rate of the input frame pictures.

9. An image processing method as set forth in claim 5, wherein the display device is an impulse type display device, and when it is discriminated that the picture to be displayed is a moving picture and when it is determined that the moving speed of the moving object in the moving picture is in the second state, the production of the output frame pictures comprises:

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comparing the refresh rate of the input frame pictures with the refresh rate of the output frame pictures;

outputting the input frame pictures as the output frame picture, when the refresh rate of the input frame pictures is equal to the refresh rate of the output frame pictures;

stopping the output of signals between the input frame pictures, or inserting and outputting a black raster picture, when the refresh rate of the output frame pictures is higher than the refresh rate of the input frame pictures; and

thinning out the input frame pictures to produce and output the output frame pictures, when the refresh rate of the output frame pictures is lower than the refresh rate of the input frame pictures.

10. An image processing method as set forth in claim 5, wherein the display device is a hold type display device, and when it is discriminated that the picture to be displayed is a moving picture and when it is determined that the moving speed of the moving object in the moving picture is in the second state, the production of the output frame pictures comprises:

comparing the refresh rate of the input frame pictures with the refresh rate of the output frame pictures;

outputting the input frame pictures as the output frame picture, when the refresh rate of the input frame pictures is equal to the refresh rate of the output frame pictures;

stopping the outputs of the output picture signal and the output synchronizing signal between the input frame pictures, when the refresh rate of the output frame pictures is higher than the refresh rate of the input frame pictures; and

thinning out the input frame pictures to produce

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and output the output frame pictures, when the refresh rate of the output frame pictures is lower than the refresh rate of the input frame pictures.

11. An image processing method as set forth in claim 5, wherein when it is discriminated that the picture to be displayed is a still picture, the production of the output frame pictures comprises:

comparing the refresh rate of the input frame pictures with the refresh rate of the output frame pictures;

outputting the input frame pictures as the output frame picture, when the refresh rate of the input frame pictures is equal to the refresh rate of the output frame pictures;

displaying the same picture between the output frame pictures, or stopping the output of signals between the input frame pictures, when the refresh rate of the output frame pictures is higher than the refresh rate of the input frame pictures; and

thinning out the input frame pictures to produce and output the output frame pictures, when the refresh rate of the output frame pictures is lower than the refresh rate of the input frame pictures.

12. An image processing method as set forth in claim 1, wherein the interpolated picture or the black raster picture is selected in accordance with a spatial frequency and the frequency spectrum in one frame picture.

13. An image processing method as set forth in claim 1, wherein the interpolated picture or the black raster picture is selected in accordance with the speed of a moving object in the picture to be displayed.

14. An image processing system comprising a picture

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signal converting part converting an input picture signal, which is a picture signal for a picture to be displayed on a display device for displaying a picture while changing the picture every frame picture, and an input synchronizing signal, which is synchronized with the input picture signal, into an output picture signal, which is a picture signal for a picture suitable for the display for the display device, and an output synchronizing signal which is synchronized with the output picture signal, on the basis of picture information of the picture to be displayed on the display device, the picture signal converting part comprising:

an input frame memory in which a input frame picture is recorded;

an input switching part transmitting a input frame picture to be displayed, to the input frame memory on the basis of the input picture signal and the input synchronizing signal;

a black raster picture producing part in which a black raster picture has been produced or stored;

a picture converting part producing output frame pictures from input frame pictures, which have been recorded in the input frame memory, by producing an interpolated picture or inserting a black raster picture or thinning out the frame pictures, between frame pictures corresponding to the picture information, on the basis of the picture information and the input synchronizing signal and the output synchronizing signal;

an output frame memory recording therein the output frame pictures; and

an output control switching part taking the output picture signal and the output synchronizing signal out of the output frame pictures, which have been recorded in the output frame memory, to transmit the signals to the display device.

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15. An image processing system as set forth in claim 14, wherein the picture information is information which indicates whether the picture to be displayed is a moving picture or a still picture, and which further comprises a motion discriminating part discriminating whether the picture to be displayed is a moving picture or a still picture.

16. An image processing system as set forth in claim 15, wherein the motion discriminating part incorporates input frame pictures to be displayed, at regular intervals on the basis of the input picture signal and input synchronizing signal, obtains the correlation between two input frame pictures which have been continuously incorporated, and discriminates whether the input frame picture to be displayed is a moving picture or a still picture on the basis of the correlation result.

17. An image processing system as set forth in claim 15, wherein the motion discriminating part comprises: a switching part incorporating input frame pictures to be displayed, at regular intervals on the basis of the input picture signal and input synchronizing signal; a plurality of frame memories for storing therein the input frame pictures which have been incorporated by the switching part; means for calculating a differential signal between two input frame pictures which have been continuously incorporated; and means for discriminating whether the input frame picture to be displayed is a moving picture or a still picture on the basis of the results of the calculation.

18. An image processing system as set forth in claim 14, wherein the picture signal converting part compares the refresh rate of the input frame pictures with the

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refresh rate of the output frame pictures,

outputs the input frame pictures as the output frame picture, or outputs the input frame pictures, between which the black raster picture is inserted, as the output frame pictures, when the refresh rate of the input frame pictures is equal to the refresh rate of the output frame pictures,

produces an interpolated picture between the input frame pictures, or outputs the input frame pictures, between which the black raster picture is inserted, as the output frame pictures, when the refresh rate of the output frame pictures is higher than the refresh rate of the input frame pictures, and

thins out the input frame pictures, or produces an interpolated picture between the input frame pictures, or outputs the input frame pictures, between which the black raster picture is inserted, as the output frame pictures, when the refresh rate of the output frame pictures is lower than the refresh rate of the input frame pictures.

19. An image processing system as set forth in claim 14, wherein the picture signal converting part produces the output frame pictures from the input frame pictures on the basis of a moving or still picture indicating signal, which indicates whether the kind of a picture to be displayed on the display device is a moving picture or a still picture, and the output of the motion discriminating part.

20. An image display system comprising:

a display device displaying a picture while changing the picture every frame picture; and

an image processing device comprising a picture signal converting part for converting an input picture signal, which is a picture signal for a picture to be displayed on a display device, and an input

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synchronizing signal, which is synchronized with the input picture signal, into an output picture signal, which is a picture signal for a picture suitable for the display for the display device, and an output synchronizing signal which is synchronized with the output picture signal, on the basis of picture information of the picture to be displayed on the display device,

the picture signal converting part comprising: an input frame memory in which a input frame picture is recorded; an input switching part transmitting a input frame picture to be displayed, to the input frame memory on the basis of the input picture signal and the input synchronizing signal; a black raster picture producing part in which a black raster picture has been produced or stored; a picture converting part producing output frame pictures from input frame pictures, which have been recorded in the input frame memory, by producing an interpolated picture or inserting a black raster picture or thinning out the frame pictures, between frame pictures corresponding to the picture information, on the basis of the picture information and the input synchronizing signal and the output synchronizing signal; an output frame memory for recording therein the output frame pictures; and an output control switching part taking the output picture signal and the output synchronizing signal out of the output frame pictures, which have been recorded in the output frame memory, to transmit the signals to the display device.

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